

An annotated checklist of bird diversity of Kheralu, Mehsana, Gujarat

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ABSTRACT

The study is aimed to collect the information regarding the species richness and feeding guilds in the Kheralu sub-district. Birds are the best indicator of habitat quality and feeding guilds is best character of it. The study area is 322 km² including 284.65 km² rural area and 37 km² urban areas approximately. During the study period between May 2019 to April 2021, we recorded 207 birds species belongs 66 families in the study area. Of the recorded species, nine are considered Near Threatened, five are considered Vulnerable and one is considered Endangered (En; *Aquila nipalensis*) by IUCN Red List criteria. The study recorded 68 migratory birds and 139 resident birds. Our findings imply that, despite human presence in the landscape, avifaunal guild variety is abundant in human dominated landscapes.

Keywords: Kheralu, Near Threatened, Vulnerable, Migratory, Feeding guilds

1. INTRODUCTION

India is considered as one of the diverse countries in the world (Gadgil and Rao, 1998) and harboring two important global biodiversity hotspots and seven endemic bird areas of the entire world (Grimmett et al., 1998). With more than 1335 bird species, India shares 12.5% of the total avifaunal richness of the world (Grimmett et al. 2011; Praveen et al., 2020c). Among them, a total of 605 bird species have been recently updated from Gujarat state (Ganpule, 2020). Birds play various roles in the ecosystem and hence are considered as an environmental indicator (Singh et al., 2018; Abie et al., 2019; Jha, 2021; Patel et al., 2021; Kushwaha et al., 2021), and the diversity of birds is directly connected to the environmental conditions of any landscape (Loreau et al., 2001). The vegetation mainly affects the diversity, abundance and distribution of birds (Gregory et al., 2010; Balodi et al., 2018). Despite various research on Gujarat's avifauna, the north Gujarat region has been relatively understudied (Patel et al., 2021; Parihar et al., 2020; Patel and Dharaiya, 2016). The present study is an effort to explore the semi-arid part of the North Gujarat with special emphasis to generate the baseline data on the avian diversity. Kheralu is located in biogeographic zone 4 – the semiarid area of Mehsana and Patan districts of Gujarat (Singh, 2001). Being a semi-arid climate, the temperature drops in winter upto 12 °C and raises to 42 °C in summer. The number of rainy

days is comparatively very less during July and August with an average annual rainfall of around 727mm.

2. MATERIAL AND METHODS

Study area

The study area (Kheralu sub-district of District Mehsana) is geographically located between 23.88°N and 72.62°E in the northern part of Gujarat state (Fig. 1). The total area of Kheralu Taluka is 322 km² including 284.65 km² rural and 37 km² urban areas. The study area has many small patches of wasteland mostly covered with shrubs and scattered trees spread surrounding the agricultural lands. The river Rupen flows through the area which dries up during the hot periods. The study area has diverse types of vegetation because of agricultural lands, woodlands, some scattered scrublands. There are some good water bodies such as Chinnabai Sarovar along with other small to medium size water bodies in the area. Some patches of unprotected dry deciduous forest of Shebhar on the north side and Taranga hill forest on the north-east side of Kheralu add a good diversity of flora and fauna. Among the flora, *Ailanthus excelsa*, *Azadirachta indica*, *Accacia tortilis*, *Prosopis juliflora*, *Accacia nilotica*, *Ziziphus nummularia*, *Balanites aegyptiaca*, *Capparis deciduas*, *Diospyros Montana*, *Cassia auriculata*, *Derris indica* are common species and *Melursus ursinus*, *Hyaena hyaena*, *Felis chaus*, *Vulpes bengalensis*, *Python molurus*, *Viverricula indica*, and *Varanus bengalensis* are faunal species in the Kheralu.

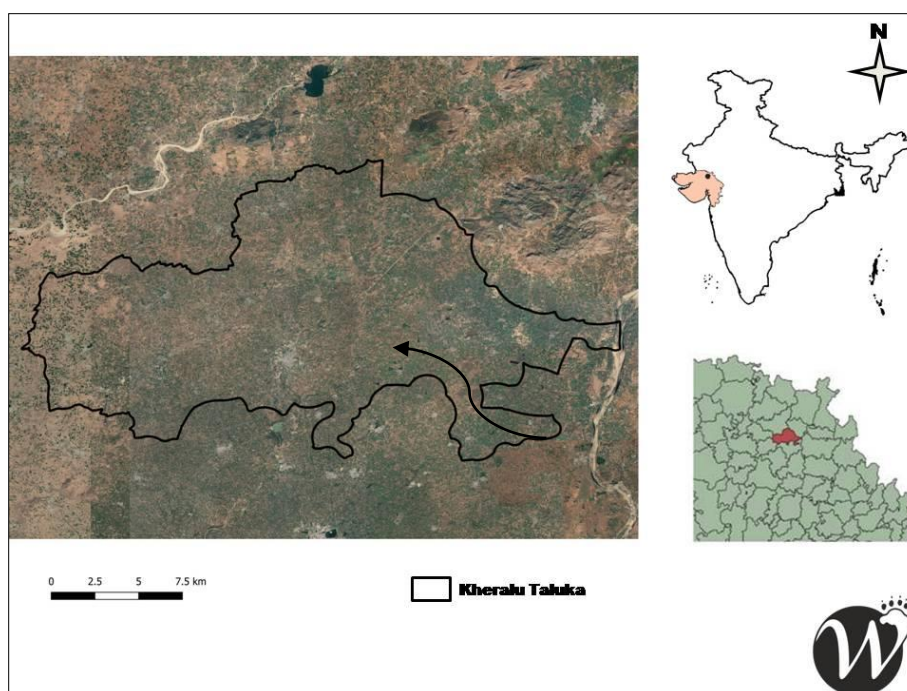


Figure 1: The location map of the Kheralu Taluka (Dist: Mehsana)

Data collection

As the highest activity of birds would be noted in low light frequency so, field data were collected in the morning (0600hrs to 1000hrs) and evening (1600hrs to 1800 hrs). Data were collected for the period of 24 months; starting from May 2019 to April 2021 covering all three distinct seasons. The study includes a total of 248 field visits with an average of 10 visits per month. The birds were identified through direct observations using binoculars (Olympus 10*50) and photographs were captured by Canon EOS 1300D & Canon EOS 550D with Tamron 70-300mm, Canon 75-300mm, Canon 55-250mm, and Opteka 500mm lenses. For the identification of birds we used the reference book such as; Birds of the Indian subcontinent (Grimmett et al., 2011), and The book of Indian birds (Salim Ali, 2002). Each species was noted according to their IUCN status from electronic version 2021-2 (IUCN, 2021). The migratory status of the bird was noted using the checklist of birds of Gujarat (Ganpule, 2016). The feeding guilds of bird species were classified into Insectivore, Herbivore, Carnivore, Omnivore, Nectarivore, Frugivore, and Graminivore (Ali, 1996). We followed Bird life International criteria to prepare the checklist of birds.

3. RESULTS AND DISCUSSION

A total of 207 species of birds belonging to 66 families (Checklist is provided in Table 1.) were recorded from the study area. Among them, 139 are resident birds and 68 are migratory (Table 1.). A total of 234 bird species in Mehsana district are listed in the latest checklist of birds of Gujarat (birdsofgujarat.co.in). Ganpule, (2020) recorded a total of 605 species of birds in Gujarat. Based on the available data, Kheralu sub-district possesses 34.21% of the bird diversity in the Gujarat state and almost 88% of Mehsana district. The study area has a huge diversity of vegetation and suitable climate condition which attracts the bird species. Figure 2 reveals the conservation status of the avifauna; a total of 192 species are the least concern (Lc), nine species are Near-threatened (Nt), five species are vulnerable (Vu) and one Endangered (En; *Aquila nipalensis*) species were recorded. The majority of Passeriformes (92 species) were recorded. Table 1. represent, the study area that has high species belonging to the Anatidae family and Muscicapidae family followed by Accipitridae family and Scolopacidae family. The study area is rich in diversity with Anatidae and Muscicapidae species with birds like Common Pochard (*Aythya ferina*), Gadwall (*Mareca strepera*), Northern Shoveler (*Spatula clypeata*) Black Redstart (*Phoenicurus ochruros*), Tickell's blue flycatcher (*Cyornis tickelliae*), Oriental Magpie Robin (*Copsychus saularis*), Red-breasted Flycatcher (*Ficedula parva*). Four species from the Strigidae family were sighted and one species belonging to the Tytonidae family was recorded.

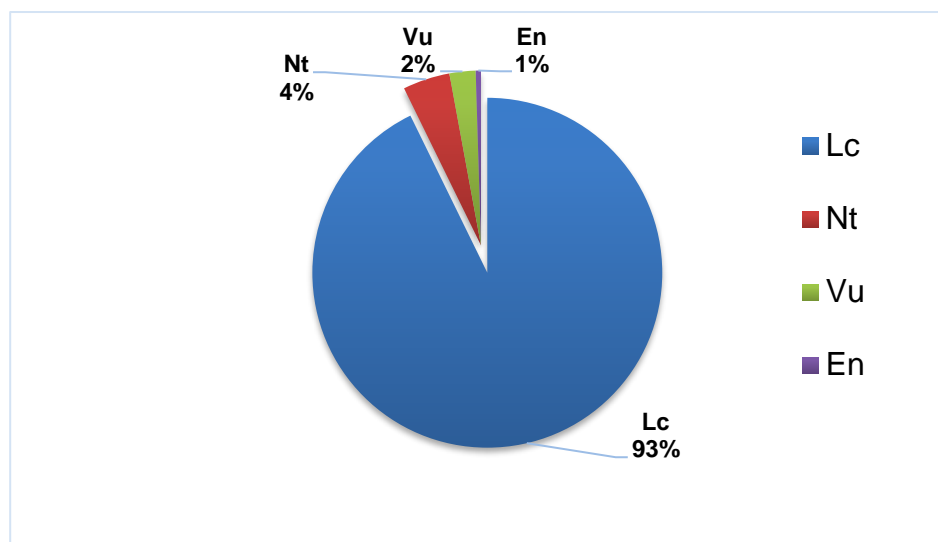


Figure 2: IUCN status wise distribution of avifaunal diversity in Kheralu (Dist. Mehsana).

Table No. 1: Checklist of avifaunal diversity of Kheralu Taluka (Dist: Mehsana, Gujarat)

(Lc= Least concern, En= Endangered, Vu= Vulnerable, Nt= Near-threatened,

R= Resident, M= Migrant)

Common Name	Scientific Name	IUCN Status	Migratory Status	Feeding Habits
Order: Accipitriformes				
Family: Accipitridae				
Black Kite	<i>Milvus migrans</i>	Lc	R	Carnivore
Black-winged Kite	<i>Elanus axillaris</i>	Lc	R	Carnivore
Booted Eagle	<i>Hieraaetus pennatus</i>	Lc	M	Carnivore
Common Buzzard	<i>Buteo buteo</i>	Lc	M	Carnivore
Eurasian Sparrowhawk	<i>Accipiter nisus</i>	Lc	M	Carnivore
Long-legged Buzzard	<i>Buteo rufinus</i>	Lc	M	Carnivore
Marsh Harrier	<i>Circus aeruginosus</i>	Lc	M	Carnivore
Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	Lc	R	Carnivore

Shikra	<i>Accipiter badius</i>	Lc	R	Carnivore
Short-toed Snake Eagle	<i>Circus gallicus</i>	Lc	R	Carnivore
Steppe Eagle	<i>Aquila nipalensis</i>	En	M	Carnivore
White-eyed Buzzard	<i>Butastur teesa</i>	Lc	R	Carnivore
Order: Anseriformes				
Family: Anatidae				
Common Pochard	<i>Aythya ferina</i>	Vu	M	Omnivore
Common Teal	<i>Anas crecca</i>	Lc	M	Herbivore
Cotton Pygmy Goose	<i>Nettapus coromandelianus</i>	Lc	R	Omnivore
Ferruginous Duck	<i>Aythya nyroca</i>	Nt	M	Omnivore
Gadwall	<i>Mareca strepera</i>	Lc	M	Herbivore
Garganey	<i>Spatula querquedula</i>	Lc	M	Herbivore
Greylag Goose	<i>Anser anser</i>	Lc	M	Herbivore
Indian spot-billed Duck	<i>Anas poecilorhyncha</i>	Lc	R	Omnivore
Knob-billed Duck	<i>Sarkidiornis melanotos</i>	Lc	M	Omnivore
Lesser Whistling Duck	<i>Dendrocygna javanica</i>	Lc	R	Omnivore
Northern Pintail	<i>Anas acuta</i>	Lc	M	Herbivore
Northern Shoveler	<i>Spatula clypeata</i>	Lc	M	Omnivore
Ruddy Shelduck	<i>Tadorna ferruginea</i>	Lc	M	Omnivore
Tufted Duck	<i>Aythya fuligula</i>	Lc	M	Omnivore
Order: Bucerotiformes				
Family: Bucerotidae				
Indian Grey Hornbill	<i>Ocyrceros birostris</i>	Lc	R	Omnivore
Family: Upupidae				
Common Hoopoe	<i>Upupa epops</i>	Lc	R	Omnivore
Order: Caprimulgiformes				
Family: Apodidae				
Little Swift	<i>Apus affinis</i>	Lc	R	Insectivore
Order: Charadriiformes				
Family: Burhinidae				
Indian Thick-knee	<i>Burhinus indicus</i>	Lc	R	Omnivore
Family: Charadriidae				
Little-ringed Plover	<i>Charadrius dubius</i>	Lc	M	Omnivore
Red-wattled Lapwing	<i>Vanellus indicus</i>	Lc	R	Omnivore
Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	Lc	R	Omnivore
Family: Jacanidae				
Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	Lc	R	Omnivore
Family: Laridae				
River Tern	<i>Sterna aurantia</i>	Vu	M	Carnivore
Family: Recurvirostridae				
Black-winged Stilt	<i>Himantopus himantopus</i>	Lc	R	Omnivore
Family: Rostratulidae				
Greater-painted Snipe	<i>Rostratula benghalensis</i>	Lc	M	Omnivore
Family: Scolopacidae				
Black-tailed Godwit	<i>Limosa limosa</i>	Nt	M	Omnivore

Common Greenshank	<i>Tringa nebularia</i>	Lc	M	Carnivore
Common Redshank	<i>Tringa totanus</i>	Lc	M	Carnivore
Common Sandpiper	<i>Actitis hypoleucos</i>	Lc	M	Carnivore
Common Snipe	<i>Gallinago gallinago</i>	Lc	R	Carnivore
Curlew Sandpiper	<i>Calidris ferruginea</i>	Nt	M	Carnivore
Eurasian Curlew	<i>Numenius arquata</i>	Nt	M	Omnivore
Green Sandpiper	<i>Tringa ochropus</i>	Lc	M	Carnivore
Little Stint	<i>Calidris minuta</i>	Lc	M	Carnivore
Marsh Sandpiper	<i>Tringa stagnatilis</i>	Lc	M	Carnivore
Ruff	<i>Calidris pugnax</i>	Lc	M	Herbivore
Wood Sandpiper	<i>Tringa glareola</i>	Lc	R	Carnivore
Order: Ciconiiformes				
Family: Ciconiidae				
Asian Openbill	<i>Anastomus oscitans</i>	Lc	R	Carnivore
Painted Stork	<i>Mycteria leucocephala</i>	Nt	M	Carnivore
Woolly-necked Stork	<i>Ciconia episcopus</i>	Vu	R	Carnivore
Order: Columbiformes				
Family: Columbidae				
Eurasian-collared Dove	<i>Streptopelia decaocto</i>	Lc	R	Graminivore
Laughing Dove	<i>Spilopelia senegalensis</i>	Lc	R	Graminivore
Red-turtle Dove	<i>Streptopelia tranquebarica</i>	Lc	R	Graminivore
Rock Pigeon	<i>Columba livia</i>	Lc	R	Graminivore
Spotted Dove	<i>Spilopelia chinensis</i>	Lc	R	Graminivore
Yellow-footed Green Pigeon	<i>Treron phoenicopterus</i>	Lc	R	Frugivore
Order: Coraciiformes				
Family: Alcedinidae				
Common Kingfisher	<i>Alcedo atthis</i>	Lc	R	Carnivore
Pied Kingfisher	<i>Ceryle rudis</i>	Lc	R	Carnivore
White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Lc	R	Carnivore
Family: Coraciidae				
Eurasian Roller	<i>Coracias garrulus</i>	Lc	M	Carnivore
Indian Roller	<i>Coracias benghalensis</i>	Lc	R	Carnivore
Family: Meropidae				
Blue-chicked Bee-eater	<i>Merops pesicus</i>	Lc	M	Insectivore
Blue- tailed Bee-eater	<i>Merops philippinus</i>	Lc	M	Insectivore
Green Bee-eater	<i>Merops orientalis</i>	Lc	R	Insectivore
Order: Cuculiformes				
Family: Cuculidae				
Asian Koel	<i>Eudynamis scolopaceus</i>	Lc	R	Omnivore
Common Cuckoo	<i>Cuculus canorus</i>	Lc	M	Omnivore
Common Hawk-Cuckoo	<i>Hierococcyx varius</i>	Lc	R	Omnivore
Greater Crowphesant	<i>Centropus sinensis</i>	Lc	R	Omnivore
Jacobin Cuckoo	<i>Clamator jacobinus</i>	Lc	M	Omnivore
Order: Falconiformes				
Family: Falconidae				

Red-necked Falcon	<i>Falco chicquera</i>	Nt	R	Carnivore
Order: Galliformes				
Family: Phasianidae				
Grey Francolin	<i>Francolinus pondicerianus</i>	Lc	R	Omnivore
Indian Peafowl	<i>Pavo cristatus</i>	Lc	R	Omnivore
Jungle Bush Quail	<i>Perdica asiatica</i>	Lc	R	Omnivore
Order: Gruiformes				
Family: Gruidae				
Sarus Crane	<i>Antigone antigone</i>	Vu	R	Omnivore
Family: Rallidae				
Common Coot	<i>Fulica atra</i>	Lc	M	Omnivore
Eurasian Moorhen	<i>Gallinula chloropus</i>	Lc	R	Omnivore
Grey-headed Swampphen	<i>Porphyrio porphyrio</i>	Lc	R	Omnivore
White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Lc	R	Omnivore
Order: Passeriformes				
Family: Acrocephalidae				
Booted Warbler	<i>Iduna caligata</i>	Lc	M	Insectivore
Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	Lc	M	Insectivore
Sykes's Warbler	<i>Iduna rama</i>	Lc	M	Insectivore
Family: Aegithinidae				
Common Iora	<i>Aegithina tiphia</i>	Lc	R	Insectivore
White-tailed Iora	<i>Aegithina nigrolutea</i>	Lc	R	Insectivore
Family: Alaudidae				
Ashy-crowned Sparrow Lark	<i>Eremopterix griseus</i>	Lc	R	Insectivore
Family: Campephagidae				
Large Cuckooshrike	<i>Corocina macei</i>	Lc	R	Insectivore
Small Minivet	<i>Pericrocotus cinnamomeus</i>	Lc	R	Insectivore
Family: Caprimulgidae				
Indian Nightjar	<i>Caprimulgus asiaticus</i>	Lc	R	Insectivore
Family: Cisticolidae				
Ashy Prinia	<i>Prinia socialis</i>	Lc	R	Insectivore
Common Tailorbird	<i>Orthotomus sutorius</i>	Lc	R	Insectivore
Graceful Prinia	<i>Prinia gracilis</i>	Lc	R	Insectivore
Grey-breasted Prinia	<i>Prinia hodgasonii</i>	Lc	R	Insectivore
Jungle Prinia	<i>Prinia sylvatica</i>	Lc	R	Insectivore
Plain Prinia	<i>Prinia inornata</i>	Lc	R	Insectivore
Rufous-fronted Prinia	<i>Prinia buehneri</i>	Lc	R	Insectivore
Zitting Cisticola	<i>Cisticola juncidis</i>	Lc	R	Insectivore
Family: Corvidae				
Common Raven	<i>Corvus corax</i>	Lc	R	Omnivore
House Crow	<i>Corvus splendens</i>	Lc	R	Omnivore
Jungle Crow	<i>Corvus macrorhynchos</i>	Lc	R	Omnivore
Rufous Treepie	<i>Dendrocitta vagabunda</i>	Lc	R	Omnivore
Family: Dicaeidae				
Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	Lc	R	Herbivore

Thick-billed Flowepecker	<i>Dicaeum agile</i>	Lc	R	Herbivore
Family: Dicruridae				
Ashy Drongo	<i>Dicrurus leucophaeus</i>	Lc	M	Insectivore
Black Drongo	<i>Dicrurus macrocercus</i>	Lc	R	Insectivore
White-bellied Drongo	<i>Dicrurus caerulescens</i>	Lc	R	Insectivore
Family: Emberizidae				
Crested Bunting	<i>Emberiza lathami</i>	Lc	R	Graminivore
Family: Estrilidae				
Indian Silverbill	<i>Euodice malabarica</i>	Lc	R	Graminivore
Red Avadavat	<i>Amandava amandava</i>	Lc	R	Omnivore
Scaly-breasted Munia	<i>Lonchura punctulata</i>	Lc	R	Insectivore
Tricolored Munia	<i>Lonchura malacca</i>	Lc	R	Insectivore
Family: Fringillidae				
Common Rosefinch	<i>Carpodacus erythrinus</i>	Lc	M	Omnivore
Family: Hirundinidae				
Barn Swallow	<i>Hirundorustica</i>	Lc	R	Insectivore
Dusky Craig Martin	<i>Ptyonoprogneconclor</i>	Lc	R	Insectivore
Red-rumped Swallow	<i>Cecropisdaurica</i>	Lc	R	Insectivore
Streak-throated Swallow	<i>Petrochelidonfulvicola</i>	Lc	R	Insectivore
Wire-tailed Swallow	<i>Hirundosmithii</i>	Lc	M	Insectivore
Family: Laniidae				
Bay-backed Shrike	<i>Lanius vittatus</i>	Lc	R	Carnivore
Brown Shrike	<i>Lanius cristatus</i>	Lc	M	Carnivore
Isabelline Shrike	<i>Lanius isabellinus</i>	Lc	M	Carnivore
Long-tailed Shrike	<i>Lanius schach</i>	Lc	R	Carnivore
Red-backed Shrike	<i>Lanius collurio</i>	Lc	M	Carnivore
Family: Leiotrichidae				
Common Babbler	<i>Argya caudata</i>	Lc	R	Omnivore
Jungle Babbler	<i>Turdoides striata</i>	Lc	R	Omnivore
Large Grey Babbler	<i>Argya malcolmi</i>	Lc	R	Omnivore
Family: Monarchidae				
Asian Paradise Flycatcher	<i>Terpsiphone paradisi</i>	Lc	R	Insectivore
Family: Motacillidae				
Citrine Wagtail	<i>Motacilla citreola</i>	Lc	M	Insectivore
Gray Wagtail	<i>Motacilla cinerea</i>	Lc	M	Insectivore
Paddyfield Pipit	<i>Anthus rufulus</i>	Lc	R	Insectivore
Tree Pipit	<i>Anthus trivialis</i>	Lc	M	Omnivore
Western-yellow Wagtail	<i>Motacilla flava</i>	Lc	M	Insectivore
White-browed Wagtail	<i>Motacilla maderaspatensis</i>	Lc	R	Insectivore
White Wagtail	<i>Motacilla alba</i>	Lc	M	Insectivore
Family: Muscicapidae				
Black Redstart	<i>Phoenicurus ochruros</i>	Lc	M	Insectivore
Bluethroat	<i>Cyanecula svecica</i>	Lc	M	Insectivore
Blue Rock Thrush	<i>Monticola solitarius</i>	Lc	M	Insectivore
Brown Rockchat	<i>Oenanthe fusca</i>	Lc	R	Insectivore

Indian Robin	<i>Saxicoloides fulicatus</i>	Lc	R	Insectivore
Isabelline Wheatear	<i>Oenanthe isabellina</i>	Lc	M	Insectivore
Oriental Magpie Robin	<i>Copsychus saularis</i>	Lc	R	Insectivore
Pied Bushchat	<i>Saxicola caprata</i>	Lc	R	Insectivore
Red-breasted Flycatcher	<i>Ficedula parva</i>	Lc	M	Insectivore
Siberian Stonechat	<i>Saxicola maurus</i>	Lc	R	Insectivore
Spotted Flycatcher	<i>Muscicapa striata</i>	Lc	M	Insectivore
Tickell's Blue Flycatcher	<i>Cyornis tickelliae</i>	Lc	R	Insectivore
Variable Wheatear	<i>Oenanthe picata</i>	Lc	M	Insectivore
Verditer Flycatcher	<i>Eumyias thalassinus</i>	Lc	R	Insectivore
Family: Nectariniidae				
Purple Sunbird	<i>Cinnyris asiaticus</i>	Lc	R	Nectarivore
Purple rumped Sunbird	<i>Leptocoma zeylonica</i>	Lc	R	Nectarivore
Family: Oriolidae				
Indian Golden Oriole	<i>Oriolus oriolus</i>	Lc	R	Omnivore
Family: Passeridae				
Chestnut Shouldered Petronia	<i>Gymnoris xanthocolis</i>	Lc	R	Omnivore
House Sparrow	<i>Passer domesticus</i>	Lc	R	Omnivore
Family: Paridae				
Great Tit	<i>Parus major</i>	Lc	R	Omnivore
White-naped Tit	<i>Machlolophus nuchalis</i>	Vu	R	Omnivore
Family: Phylloscopidae				
Common Chiffchaff	<i>Phylloscopus collybita</i>	Lc	M	Insectivore
Family: Ploceidae				
Baya Weaver	<i>Ploceus philippinus</i>	Lc	R	Insectivore
Black-breasted Weaver	<i>Ploceus benghalensis</i>	Lc	R	Insectivore
Family: Pycnonotidae				
Red-vented Bulbul	<i>Pycnonotus cafer</i>	Lc	R	Omnivore
White-browed Bulbul	<i>Pycnonotus luteolus</i>	Lc	R	Omnivore
White-eared Bulbul	<i>Pycnonotus leucotis</i>	Lc	R	Omnivore
Family: Rhipiduridae				
White-browed Fantail	<i>Rhipidura albicollis</i>	Lc	R	Insectivore
White-spotted Fantail	<i>Rhipidura albogularis</i>	Lc	R	Insectivore
Family: Stenostriidae				
Grey-headed Canary Flycatcher	<i>Culicicapa ceyloensis</i>	Lc	R	Insectivore
Family: Sturnidae				
Asian Pied Starling	<i>Gracupica contra</i>	Lc	R	Omnivore
Bank Myna	<i>Acridotheres ginginianus</i>	Lc	R	Omnivore
Brahminya Starling	<i>Sturnia pagodarum</i>	Lc	R	Omnivore
Common Myna	<i>Acridotheres tristis</i>	Lc	R	Omnivore
Rosy Starling	<i>Pastor roseus</i>	Lc	M	Omnivore
Family: Sylviidae				
Greater Whitethroat	<i>Sylvia communis</i>	Lc	R	Insectivore
Lesser Whitethroat	<i>Sylvia curruca</i>	Lc	M	Nectarivore
Eastern Orphean Warbler	<i>Curruca crassirostris</i>	Lc	R	Nectarivore

Yellow-eyed Babbler	<i>Chrysomma sinense</i>	Lc	R	Insectivore
Family: Timaliidae				
Tawny-billed Babbler	<i>Dumetia hyperythra</i>	Lc	R	Insectivore
Family: Vangidae				
Common Woodshrike	<i>Tephrodornis pondicerianus</i>	Lc	R	Insectivore
Family: Zosteropidae				
Indian White-eye	<i>Zosterops palpebrosus</i>	Lc	R	Frugivore
Order: Pelecaniformes				
Family: Ardeidae				
Cattle Egret	<i>Bubulcus ibis</i>	Lc	R	Carnivore
Crown-night Heron	<i>Nycticorax nycticorax</i>	Lc	R	Carnivore
Great Egret	<i>Ardea alba</i>	Lc	R	Carnivore
Grey Heron	<i>Ardea cinera</i>	Lc	R	Carnivore
Indian Pond Heron	<i>Ardeola grayii</i>	Lc	R	Carnivore
Intermediate Egret	<i>Ardea intermedia</i>	Lc	R	Carnivore
Little Egret	<i>Egretta garzetta</i>	Lc	R	Carnivore
Purple Heron	<i>Ardea purpurea</i>	Lc	R	Carnivore
Family: Pelecanidae				
Great White Pelican	<i>Pelecanus onocrotalus</i>	Lc	M	Carnivore
Family: Threskiornithidae				
Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Lc	R	Carnivore
Eurasian Spoonbill	<i>Platalea leucorodia</i>	Lc	M	Carnivore
Glossy Ibis	<i>Plegadis falcinellus</i>	Lc	R	Carnivore
Red-naped Ibis	<i>Pseudibis papillosa</i>	Lc	R	Carnivore
Order: Phoenicopteriformes				
Family: Phoenicopteridae				
Greater Flamingo	<i>Phoenicopterus roseus</i>	Lc	M	Omnivore
Lesser Flamingo	<i>Phoeniconaias minor</i>	Nt	M	Omnivore
Order: Piciformes				
Family: Megalaimidae				
Coppersmith Barbet	<i>Psilopogon haemacephalus</i>	Lc	R	Frugivore
Family: Picidae				
Eurasian Wryneck	<i>Jynx torquilla</i>	Lc	M	Insectivore
Lesser Golden-backed Woodpecker	<i>Dinopium benghalense</i>	Lc	R	Insectivore
Yellow-crowned woodpecker	<i>Leiopicus mahrattensis</i>	Lc	R	Insectivore
Order: Podicipediformes				
Family: Podicipedidae				
Great-crested Grebe	<i>Podiceps cristatus</i>	Lc	M	Carnivore
Little Grebe	<i>Tachybaptus ruficollis</i>	Lc	R	Carnivore
Order: Psittaciformes				
Family: Psittacidae				
Alexandrine Parakeet	<i>Psittacula eupatria</i>	Nt	R	Frugivore
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	Lc	R	Frugivore
Rose-ringed Parakeet	<i>Psittacula krameri</i>	Lc	R	Frugivore
Order: Strigiformes				

Family: Strigidae				
Indian Scops Owl	<i>Otus bakkamoena</i>	Lc	R	Carnivore
Mottled Wood Owl	<i>Strix ocellata</i>	Lc	R	Carnivore
Spotted Owlet	<i>Athene brama</i>	Lc	R	Carnivore
Family: Tytonidae				
Barn Owl	<i>Tyto alba</i>	Lc	R	Carnivore
Order: Suliformes				
Family: Anhingidae				
Oriental Darter	<i>Anhinga melanogaster</i>	Nt	R	Carnivore
Family: Phalacrocoracidae				
Great Cormorant	<i>Phalacrocorax carbo</i>	Lc	M	Carnivore
Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	Lc	R	Carnivore
Little Cormorant	<i>Microcarbo niger</i>	Lc	R	Carnivore

Owls are good bio-indicators of ecosystem health and biodiversity. 12 species belonging to Accipitridae are sighted, namely, Black-winged Kite (*Elanus caeruleus*), Oriental-honey Buzzard (*Pernis ptilorhynchus*), White-eyed Buzzard (*Butastur teesa*), and Shikra (*Accipiter badius*). Although owls and raptors can acclimatize according to environment and their populations are suggestive of ecosystem problems or changes. (Movalli et al., 2008). Raptors are considered on the third or fourth level consumers and play an important role in the ecosystem and are also known for controlling the rodent and small mammal population. Also observed Indian Grey Hornbill (*Ocyrceros birostris*) during the study the species plays a vital role in the dispersal of seeds. Three species, Common Kingfisher (*Alcedo atthis*), Pied Kingfisher (*Ceryle rudis*), and White-throated Kingfisher (*Halcyon smyrnensis*) belonging to Alcedinidae the family are sighted near the water body and are good indicators of freshwater community health. Alexandrine Parakeet (*Psittacula eupatria*), Plum-headed Parakeet (*Psittacula cyanocephala*), Rose-ringed Parakeet (*Psittacula krameri*) were sighted near the farm areas and are considered a pest to the farmers. Major feeding guilds observed in bird species are Insectivores in the proportion of 31%, followed by Carnivores and Omnivores in the same proportion of 29% and 28%. Others are Herbivores, Graminivores, Frugivores, and Nectarivores in proportion to 12% (Fig. 3). The importance of the feeding guilds will guide us in the use of the habitat and niche of the species.

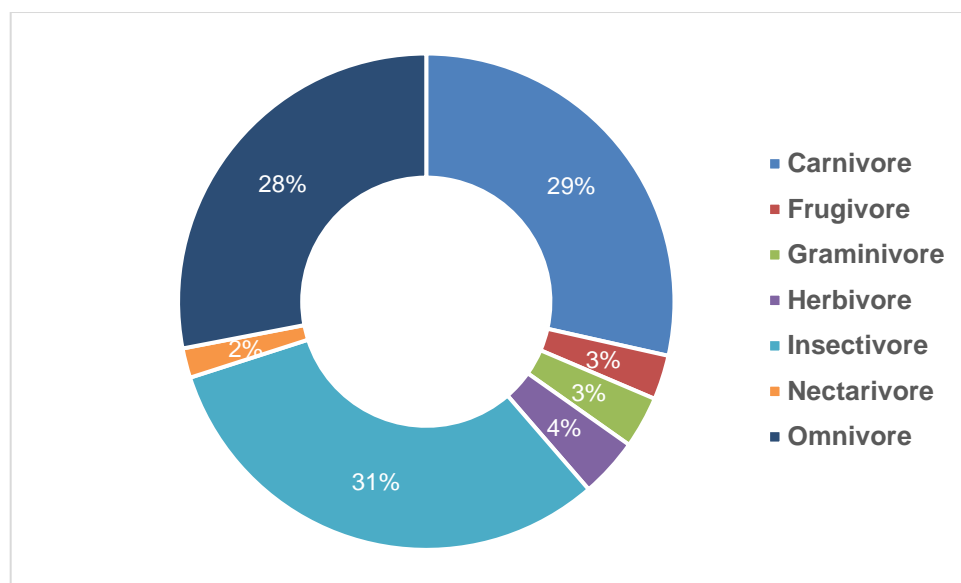


Figure 3: Feeding guilds wise distribution of avifaunal diversity in Kheralu (Dist. Mehsana)

4. CONCLUSION

During this study period, 207 species of birds representing 66 families were recorded. 139 resident types, 68 migratory were observed. There is some difference in seasonal avifaunal diversity in the present study area. With respect to feeding guilds, largest number of species were recorded from Insectivore and carnivore.

Authors' contribution:

All authors contributed equally.

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Ethical approval

The ethical guidelines are followed in the study for identification of birds. For the identification of birds, we used the reference book such as; Birds of the Indian subcontinent. We followed Bird life International criteria to prepare the checklist of birds.

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Conflicts of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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